

# Does X-Ray radiation affect zebra fish embryos?

By: Kayla Asbach and Sammy Serkowski

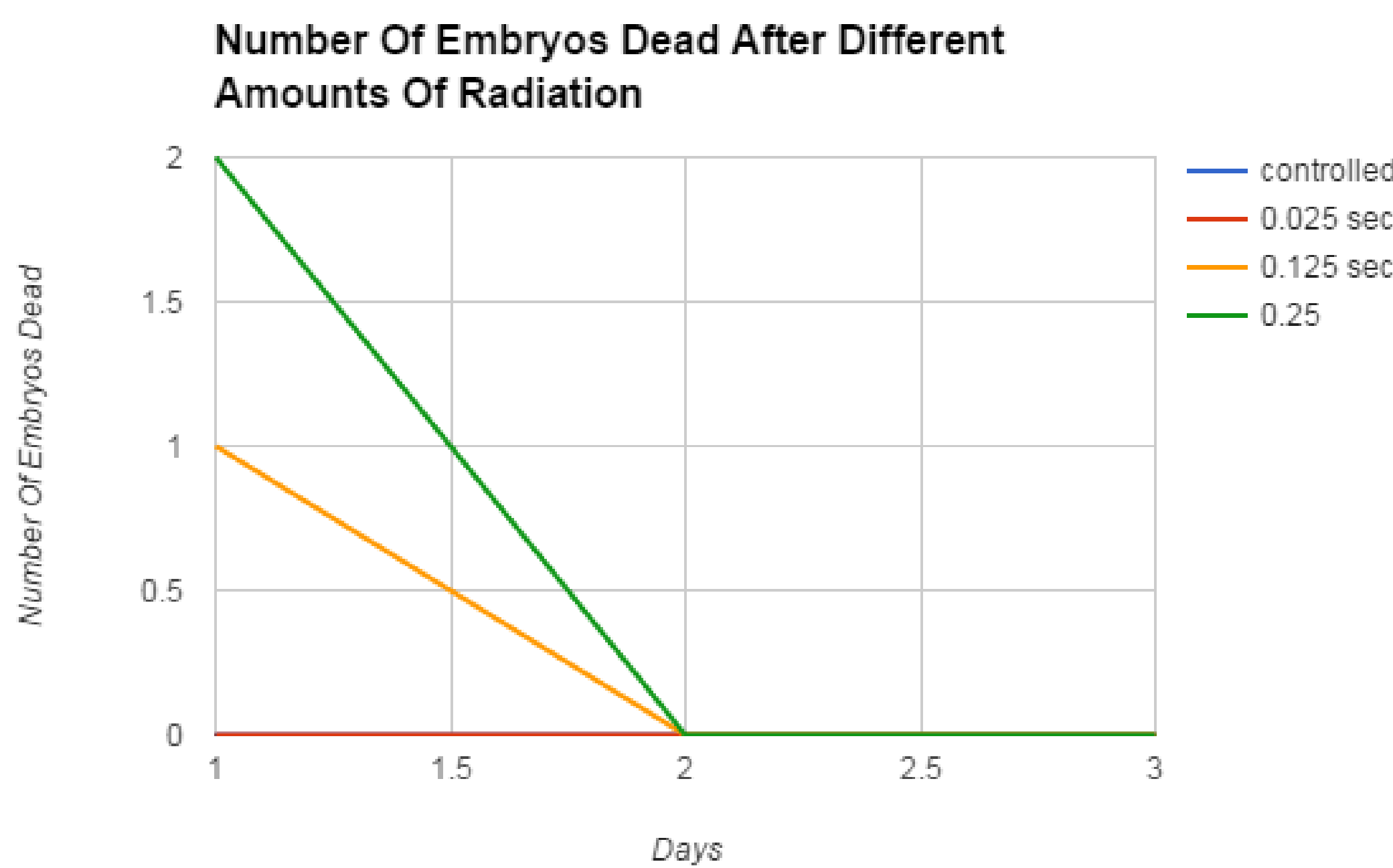
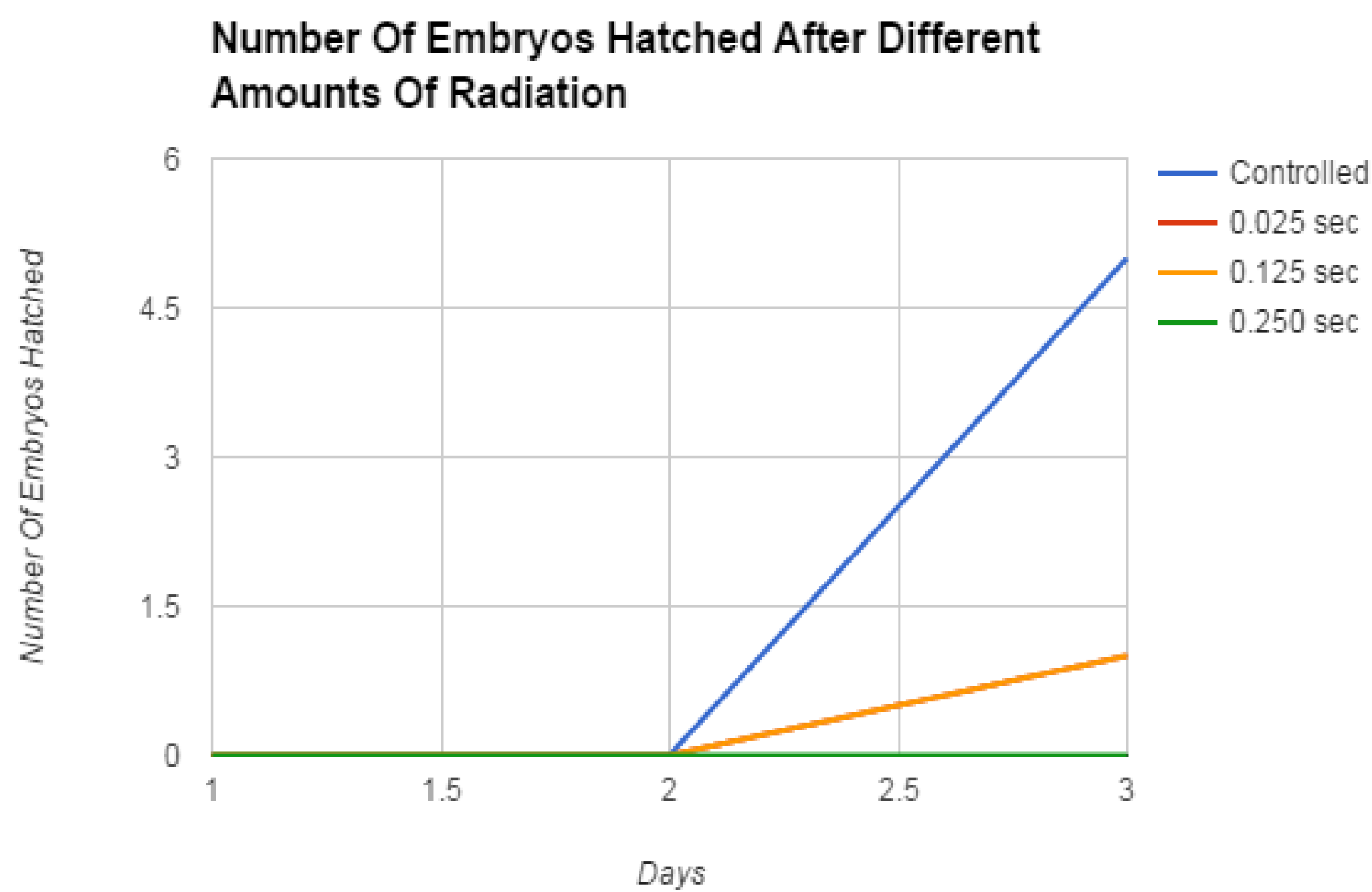


## Abstract

The purpose of this experiment was to see if x-ray radiation had an effect on the development, mortality, and the hatch rate of zebrafish embryos. The use of x-rays during pregnancy in humans has shown an increased risk of birth defects, miscarriages, and an increased risk of the fetus having leukemia in their lifetime. Our results showed that there is a correlation between birth defects and x-rays. The embryos that were exposed to more radiation had more deaths and were less active than those who weren't exposed as long.

## Introduction

Studies were done that were similar to our experiment. In Goldstein's study, mouse embryos were used instead of zebrafish embryos. Although the species were different, the results were similar to our hypothesis. In the publication it states "Developmental failure of embryos irradiated at the 2-cell, 4-cell, and 8-cell stages was a combination of preimplantation and post implantation deaths, whereas failure of embryos irradiated at the morula and blastocyst stages occurred predominantly post implantation". (Radiation and Pregnancy) The mice embryos did not die, but when it came time for them to develop the 2nd, 4th, and 8th cell, it showed failure. The cells did not develop right, which is what we expected so the embryos will have birth defects. Different from our experiment, Damoulakis' study tested x-ray use throughout the pregnancy. The embryos were never taken out from the mother and the scans were done in each trimester. "the embryo/fetus dose in bone density measurements of spine and femur using pencil beam DXA is lower than the average daily natural background in the United States of 8 mGy". (Radiation and Pregnancy) These results are similar to the mice embryo study because the outcome was defects that modified the growth and development in the mice. Overall both studies used different subjects as well as different variables; the outcome however was the same. The embryos all had failed or changed developmental effects. Our hypothesis stated that the zebrafish embryo's that were exposed to radiation would have more birth defects or more embryo deaths.



## Results

In this experiment, the independent variable was the amount of radiation exposure and the dependent variable was the mortality rate, hatch rate and the abnormalities of the zebrafish embryos. The control in this experiment was tray 1 with no exposure to radiation. Graph 1 shows the comparison of the embryo's hatched in the different exposures. The controlled wells had the highest amount of hatched eggs (5 eggs). The wells exposed to 0.025 and 0.125 seconds had the same amount of eggs hatched (1 egg). The well that had 0.250 seconds had the lowest amount of eggs hatched (0 eggs). Graph 2 is showing the amount of embryo's that died after the initial radiation. Both the controlled and the 0.025 seconds of radiation had 0 embryo's die in the 3 days of the experiment. The exposure with 0.125 seconds had 1 embryo die in the first day after the exposure. The well with 0.250 seconds had highest amount that died which was 2 embryos.

## Discussion

In our results the trays exposed to radiation had a slower development, as well as deaths. The tray with the highest level of radiation was affected the most with a significant effect on the development of the embryos. The data does support our hypothesis by stating that the embryo's development was disrupted by the radiation let off by the x-rays. Error's that we could have had was the movement of the embryos while we were taking to embryos to the dentist. This could have affected the embryos because while they are developing in the tanks or in "nature" there is little to not movement of the eggs. Limitations that we could have had was that we exposed the radiation directly to the embryos. While women are pregnant the embryos have protection from the skin, adipose tissue, and the uterus. This would lead to different results because the fetus would not be exposed to as much radiation as we exposed the embryos with. A study in which mice as the subject were exposed to radiation while pregnant. The babies had some abnormalities but none of the fetuses died.

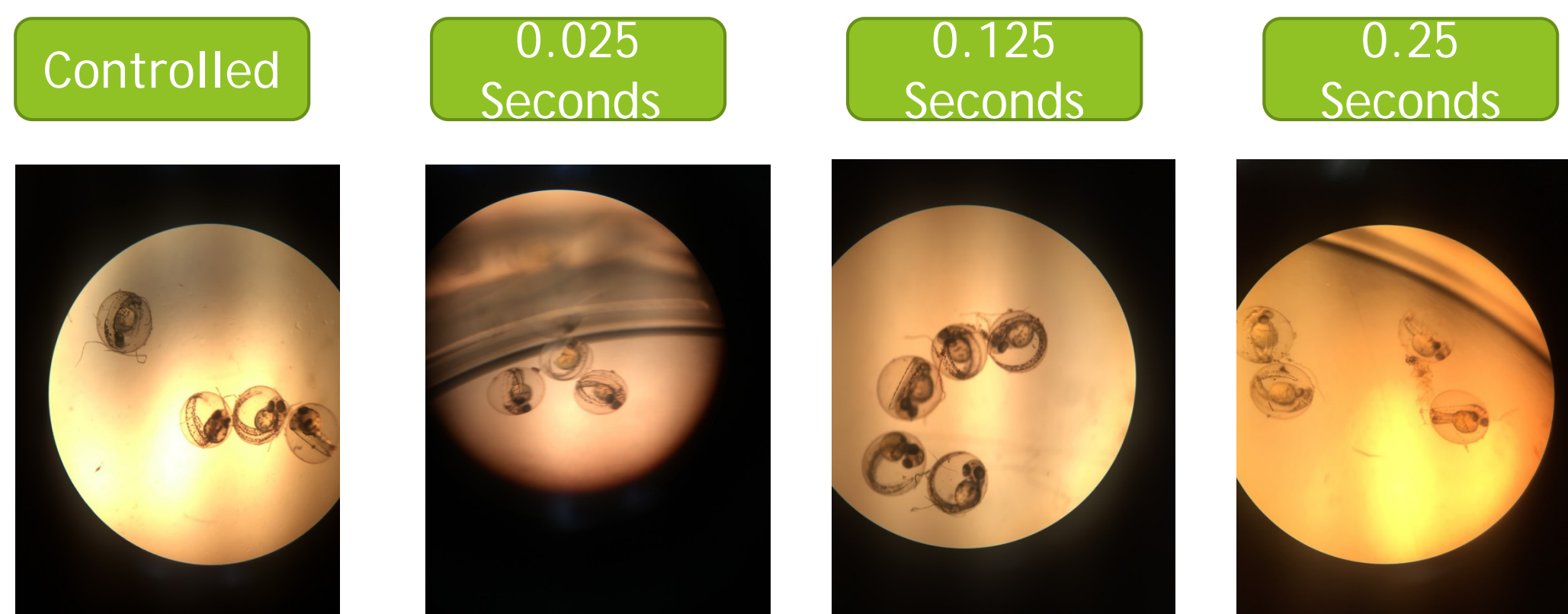
## Methods

1. After gathering our materials, 3mL of embryo media was added into two wells in each, of the 4 Falcon dishes
2. With a pipet five embryos were added into each of the wells with the solution
3. All of the trays were then taken to the dentist office where they were exposed to radiation
4. Tray 2 got 0.025 seconds of radiation (used for a small child)
5. Tray 3 got 0.125 seconds (used for a small adult)
6. Tray 4 got 0.25 seconds (used for an adult)
7. After the exposure they were taken back and placed in the incubator at 28.5°C
8. Each day observations of the abnormalities, amount dead and hatched were taken for 3 days
9. With a pipet the embryo media and the dead embryos were removed and 3 mL of new embryo media was added to each well daily

## Citations

"Radiation and Pregnancy: A Fact Sheet for Clinicians." *Centers for Disease Control and Prevention*. Centers for Disease Control and Prevention Goldstein, 17 Oct. 2014. Web. 08 Feb. 2017

Day 3



Day 4

